

### 4.3 REGULATORY STATUS

This section of the CTSA describes the federal environmental regulations that may affect the chemicals in the MHC technologies. Discharges of these chemicals may be restricted by air, water or solid waste regulations, and releases may be reportable under the federal Toxic Release Inventory (TRI) program. This section discusses pertinent portions of the Clean Water Act (Section 4.3.1), the Safe Drinking Water Act (Section 4.3.2), the Clean Air Act (Section 4.3.3), the Resources Conservation and Recovery Act (Section 4.3.4), the Comprehensive Environmental Response, Compensation and Liability Act (Section 4.3.5), the Superfund Amendments and Reauthorization Act and Emergency Planning and Community Right-to-Know Act (Section 4.3.6), and the Toxic Substances Control Act (Section 4.3.7). In addition, it summarizes pertinent portions of the Occupational Safety and Health Act (Section 4.3.8). Section 4.3.9 summarizes the federal environmental regulations by MHC technology. This information is intended to provide an overview of environmental regulations potentially triggered by MHC chemicals. It is not intended to be used as regulatory guidance.

The primary sources of information for this section were the EPA Register of Lists (EPA, 1996) and the EPA document, *Federal Environmental Regulations Affecting the Electronics Industry* (EPA, 1995b). This is a database of federal regulations applicable to specific chemicals that can be searched by chemical. The latter was prepared by the DfE PWB Project. Of the 62 chemicals used in one or more of the MHC technologies, no regulatory listings were found for 21 chemicals.

#### 4.3.1 Clean Water Act

The Clean Water Act (CWA) is the basic federal law governing water pollution control in the U.S. today. The various MHC processes used by the PWB industry contain a number of chemicals that are regulated under the CWA. Applicable provisions, as related to specific chemicals found in MHC technologies, are presented in Table 4.30; these particular provisions and process-based regulations are discussed in greater detail below.

#### **CWA Hazardous Substances and Reportable Quantities**

The CWA designates hazardous substances under Section 311(b)(2)(a) which, when discharged to navigable waters or adjoining shorelines, present an imminent and substantial danger to the public health or welfare, including fish, shellfish, wildlife, shorelines, and beaches. 40 Code of Federal Regulations (CFR) Part 117 establishes the *Reportable Quantity* (RQ) for each substance listed in 40 CFR Part 116. When an amount equal to or in excess of the RQ is discharged, the facility must provide notice to the federal government of the discharge, following Department of Transportation requirements set forth in 33 CFR Section 153.203. Liability for cleanup can result from such discharges. This requirement does not apply to facilities that discharge the substance under a National Pollutant Discharge Elimination System (NPDES) Permit or a CWA Section 404 dredge and fill permit, or to a Publicly-Owned Treatment Works (POTW), as long as any applicable effluent limitations or pretreatment standards have been met. Table 4.30 lists RQs of hazardous substances under the CWA that may apply to chemicals used in the MHC process.

**Table 4.30 CWA Regulations That May Apply to Chemicals in MHC Technologies**

Chemical	CWA 311 RQ (lbs.)	CWA Priority Pollutant	CWA 307a	CWA 304b
Ammonia	100			✓
Ammonium Chloride	5,000			
Copper (I) Chloride; Copper	10	✓	✓	✓
Copper Sulfate	10	✓	✓	✓
Ethylenediaminetetraacetic Acid (EDTA)	5,000			
Formaldehyde	100			
Formic Acid	5,000			
Hydrochloric Acid	5,000			
Isophorone		✓	✓	✓
Phosphoric Acid	5,000			
Potassium Cyanide	10	✓	✓	
Potassium Hydroxide	1,000			
Silver		✓	✓	✓
Sodium Bisulfate	5,000			
Sodium Cyanide	10	✓	✓	
Sodium Hydroxide	1,000			
Sulfuric Acid	1,000			

Abbreviations and definitions:

CWA - Clean Water Act

CWA 311 - Hazardous Substances

RQ - Reportable Quantities of CWA 311 hazardous substances

CWA 307a - Toxic Pollutants

CWA 304b - Effluent Limitations Guidelines

The NPDES permit program (40 CFR Part 122) contains regulations governing the discharge of pollutants to waters of the U.S. Forty states and one territory are authorized to administer NPDES programs that are at least as stringent as the federal program; EPA administers the program in states that are not authorized to do so. The following discussion covers federal NPDES requirements. Facilities may be required to comply with additional state requirements not covered in this document.

The NPDES program requires permits for the discharge of “pollutants” from any “point source” into “navigable waters” (except those covered by Section 404 dredge and fill permits). CWA defines all of these terms broadly, and a source is required to obtain an NPDES permit if it discharges almost anything other than dredge and fill material directly to surface waters. A source that sends its wastewater to a POTW is not required to obtain an NPDES permit, but may be required to obtain an industrial user permit from the POTW to cover its discharge.

### **CWA Priority Pollutants**

In addition to other NPDES permit application requirements, facilities will need to be aware of *priority pollutants* listed in 40 CFR Part 122, Appendix D; this list of 126 compounds

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was developed by EPA to define a specific list of chemicals to be given priority consideration in the development of effluent limitations. Each applicant for an NPDES permit must provide quantitative data for those priority pollutants which the applicant knows or has reason to believe will be discharged in greater than trace amounts. Each applicant must also indicate whether it knows or has reason to believe it discharges any of the other hazardous substances or non-conventional pollutants listed at 40 CFR Part 122, Appendix D. Quantitative testing is not required for the other hazardous pollutants; however, the applicant must describe why it expects the pollutant to be discharged and provide the results of any quantitative data about its discharge for that pollutant. Quantitative testing is required for the non-conventional pollutants if the applicant expects them to be present in its discharge.

#### **CWA Effluent Limitations Guidelines**

A principal means for attaining water quality objectives under the CWA is the establishment and enforcement of technology-based effluent limitations, which are based on the pollutant control capabilities of available technologies, taking into consideration the economic achievability of these limitations and a number of other factors. Because of differences in production processes, quantities and composition of discharges, separate standards are established for discharges associated with different industry categories. These standards are referred to as technology-based effluent limitation guidelines.

The effluent limitation to be applied to a particular pollutant in a particular case depends on the following:

- Whether the pollutant is conventional, nonconventional, or toxic.
- Whether the point source is a new or existing source.
- Whether the point source discharges directly to the waters of the U.S. or to a POTW. (Facilities that discharge to POTWs must comply with the pretreatment standards.)

Existing sources must comply with either best practicable control technology currently available (BPT), best conventional control technology (BCT), or best available control technology economically practicable (BAT) standards. New facilities must comply with New Source Performance Standards. NPDES permits must also contain any more stringent permit limitations based on state water quality standards.

In the absence of effluent limitation guidelines for a facility category, permit writers establish technology-based controls using their Best Professional Judgement. In essence, the permit writer undertakes an effluent guideline-type analysis for a single facility. The permit writer will use information such as permit limits from similar facilities using similar treatment technology, performance data from actual operating facilities, and scientific literature. Best Professional Judgement may not be used in lieu of existing effluent guidelines. These guidelines apply only to direct dischargers of wastewater.

#### **Pretreatment Standards**

Only those facilities that discharge pollutants into waters of the U.S. need to obtain an NPDES permit. Facilities that discharge to POTWs, however, must comply with pretreatment

requirements, as set out in Section 307 of the CWA. These requirements were developed because of concern that discharger's waste containing toxic, hazardous, or concentrated conventional industrial wastes might "pass through" POTWs or that pollutants might interfere with the successful operation of the POTW.

40 CFR Part 413 contains pretreatment standards for existing sources. Existing sources are those which, since July 15, 1983, have not commenced construction of any building or facility that might result in a discharge. For the MHC step of the PWB manufacturing process, the main pollutant of concern is copper and copper compounds. Table 4.31 describes PWB pretreatment standards applicable to copper.

**Table 4.31 PWB Pretreatment Standards Applicable to Copper**

	Maximum for 1 day (mg/l)	Average Daily Value for 4 Consecutive Days (mg/l)
Facilities discharging 38,000 liters or more per day - Existing Sources	4.5	2.7
Facilities discharging 38,000 liters or more per day - Existing Sources	401 <sup>a</sup>	241 <sup>a</sup>
All plants except job shops and independent PWB manufacturers - Existing Sources (metal finishing) <sup>b</sup>	3.38	2.07
New Sources <sup>c</sup> Limitations (metal finishing)	3.38	2.07

<sup>a</sup> This category reflects mass-based standards for mg/square foot operation, and may be applied in place of the preceding category under prior agreement between a source subject to these standards and the POTW receiving such regulated wastes.

<sup>b</sup> "Metal finishing" applies to plants performing any of the following operations on any basis material: electroplating, electroless plating, anodizing, coating, chemical etching and milling and PWB manufacturing. Pretreatment standards have been promulgated for Total Toxic Organics (TTO) in this category; none of the chemicals evaluated in the MHC technologies are listed.

<sup>c</sup> Pretreatment standards for new sources applies to facilities that commenced construction after July 15, 1983.

### 4.3.2 Safe Drinking Water Act

The Federal Safe Drinking Water Act (SDWA) was first passed in 1974; it has been amended several times. The purpose of the SDWA is to make sure the drinking water supplied to the public is safe and wholesome. It requires water monitoring and limitations on the presence of chemical contaminants, viruses, and other disease-causing organisms in public water systems that serve 25 or more people. The SDWA also includes provisions for protection of groundwater resources in areas around wells that supply public drinking water. In addition, the injection of wastes into deep wells that are above or below drinking water sources are regulated by the SDWA Underground Injection Program (40 CFR Part 144). While most of the regulations under the SDWA affect public water supplies and suppliers, PWB manufacturers could be affected by the groundwater protection policies or the regulation of underground injection wells.

#### **SDWA National Primary and Secondary Drinking Water Regulations**

The SDWA National Primary Drinking Water Regulations (NPDWR) (40 CFR Part 141) set maximum concentrations for substances found in drinking water that may have an adverse

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affect on human health. The National Secondary Drinking Water Regulations (NSDWR)(40 CFR Part 143) established guidelines for contaminants in drinking water that primarily affect the aesthetic qualities related to public acceptance of drinking water. The NSDWR are not federally enforceable but are intended as guidelines for the states. Table 4.32 presents MHC chemicals listed by these provisions of the SDWA.

**Table 4.32 SWDA Regulations That May Apply to Chemicals in MHC Technologies**

Chemical	SWDA NPDWR	SWDA NSDWR
Copper (I) Chloride; Copper	✓	✓
Copper Sulfate	✓	✓
Fluoroboric Acid (as fluoride)	✓	✓
Silver		✓

Abbreviations and definitions:

SDWA - Safe Drinking Water Act

SDWA NPDWR - National Primary Drinking Water Rules

SDWA NSDWR - National Secondary Drinking Water Rules

#### 4.3.3 Clean Air Act

The Clean Air Act (CAA), with its 1990 amendments, sets the framework for air pollution control in the U.S. The various MHC technologies produce a number of pollutants that are regulated under the CAA. Applicable provisions, as related to specific chemicals, are presented in Table 4.33; these particular provisions and process-based regulations are discussed below.

#### Hazardous Air Pollutants

Section 112 of the CAA established a program of regulation development for 189 hazardous air pollutants and directed EPA to add other compounds to the list as needed. EPA is authorized to establish Maximum Achievable Control Technology (MACT) standards for source categories that emit at least one of the pollutants on the list. Chemicals listed in Section 112(b) of the CAA that are used in PWB manufacturing are shown in Table 4.33. EPA is in the process of identifying categories of industrial facilities that emit substantial quantities of any of these 189 pollutants and will develop emissions limits for those industry categories.

Section 112(r) of the CAA deals with sudden releases of or accidents involving acutely toxic, explosive, or flammable chemicals. This provision, added by the CAA Amendments of 1990, establishes a list of substances which, if present in a process in a quantity in excess of a threshold, would require that the facility establish a Risk Management Program to prevent chemical accidents. This program would include preparing a risk management plan for submission to the state and to local emergency planning organizations.

**Table 4.33 CAA Regulations That May Apply to Chemicals in MHC Technologies**

Chemical	CAA 111	CAA 112b Hazardous Air Pollutants	CAA 112r
2-Ethoxyethanol	✓	✓	
1,3-Benzenediol	✓		
2-Butoxyethanol Acetate; Butylcellusolve Acetate	✓		
Ammonia			✓
Diethylene Glycol Ethyl Ether	✓		
Diethylene Glycol Methyl Ether	✓	✓	
Dimethylformamide	✓	✓	
Ethylene Glycol	✓	✓	
Fluoroboric Acid (as fluoride)	✓		
Formaldehyde	✓	✓	✓
Formic Acid	✓		
Hydrochloric Acid		✓	✓
Isophorone	✓	✓	
Methanol	✓	✓	
p-Toluene Sulfonic Acid	✓		
Potassium Cyanide		✓	
Sodium Cyanide		✓	
Sulfuric Acid	✓		

Abbreviations and definitions:

CAA - Clean Air Act

CAA 111 - Standards of Performance for New Stationary Sources of Air Pollutants-Equipment Leaks Chemical List

CAA 112b - Hazardous Air Pollutant

CAA 112r - Risk Management Program

### **Minimum Standards for State Operating Permit Programs**

The CAA and its implementing regulations (at 40 CFR Part 70) define the minimum standards and procedures required for state operating permit programs. The permit system is a new approach established by the 1990 Amendments that is designed to define each source's requirements and to facilitate enforcement. In addition, permit fees will generate revenue to fund implementation of the program.

Any facility defined as a "major source" is required to secure a permit. Section 70.2 of the regulations defines a source as a single point from which emissions are released or as an entire industrial facility that is under the control of the same person(s). A major source is defined as any source that emits or has the potential to emit:

- Ten tons per year (TPY) or more of any hazardous air pollutant.
- Twenty-five TPY or more of any combination of hazardous air pollutants.
- One hundred TPY of any air pollutant.

For ozone non-attainment areas, major sources are defined as sources with the potential to emit:

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- One hundred TPY or more of volatile organic compounds (VOCs) in areas defined as marginal or moderate.
- Fifty TPY or more of VOCs in areas classified as serious.
- Twenty-five TPY or more of VOCs in areas classified as severe.
- Ten TPY or more of VOCs in areas classified as extreme.

In addition to major sources, all sources that are required to undergo New Source Review are subject to New Source Performance Standards, or are identified by federal or state regulations, must obtain a permit.

By November 15, 1993, each state must submit a design for an operating permit program to EPA for approval. EPA must either approve or disapprove the state's program within one year after submission. Once approved, the state program goes into effect.

Major sources, as well as the other sources identified above, must submit their permit applications to the state within one year of approval of the state program. (This was scheduled to take place near the end of 1995.) Once a source submits an application, it may continue to operate until the permit is issued. Permit issuance may take years because permit processing allows time for terms and conditions to be presented to and reviewed by the public and neighboring states as well as by EPA. Applicants should make certain that their applications contain a comprehensive declaration of all allowable emissions, because current emissions are used as the basis for calculating proposed reductions to meet future limits.

When issued, the permit will include all air requirements applicable to the facility. Among these are compliance schedules, emissions monitoring, emergency provisions, self-reporting responsibilities, and emissions limitations. Five years is the maximum permit term.

As established in 40 CFR Part 70, the states are required to develop fee schedules to ensure the collection and retention of revenues sufficient to cover permit program costs. The CAA sets a presumptive minimum annual fee of \$25 per ton for all regulated pollutants (except carbon monoxide), but states can set higher or lower fees so long as they collect sufficient revenues to cover program costs.

#### **4.3.4 Resource Conservation and Recovery Act**

One purpose of the Resource Conservation and Recovery Act (RCRA) of 1976 (as amended in 1984) is to set up a cradle-to-grave system for tracking and regulating hazardous waste. EPA has issued regulations, found in 40 CFR Parts 260-299, which implement the federal statute. These regulations are Federal requirements. As of March 1994, 46 states have been authorized to implement the RCRA program and may include more stringent requirements in their authorized RCRA programs. In addition, non-RCRA-authorized states (Alaska, Hawaii, Iowa, and Wyoming) may have state laws that set out hazardous waste management requirements. A facility should always check with the state when analyzing which requirements apply to their activities.

To be a hazardous waste, a material must first be a solid waste, which is defined broadly under RCRA and RCRA regulations. Assuming the material is a solid waste, the first evaluation

to be made is whether it is also considered a hazardous waste. 40 CFR Part 261 addresses the identification and listing of hazardous waste. The waste generator has the responsibility for determining whether a waste is hazardous, and what classification, if any, may apply to the waste. The generator must examine the regulations and undertake any tests necessary to determine if the wastes generated are hazardous. Waste generators may also use their own knowledge and familiarity with the waste to determine whether it is hazardous. Generators may be subject to enforcement penalties for improperly determining that a waste is not hazardous.

### **RCRA Hazardous Waste Codes**

Wastes can be classified as hazardous either because they are listed by EPA through regulation in 40 CFR Part 261 or because they exhibit certain characteristics: toxicity, corrosivity, reactivity, or ignitability. Listed hazardous wastes are specifically named (e.g., discarded commercial toluene, spent non-halogenated solvents). Characteristic hazardous wastes are solid waste which “fail” a characteristic test, such as the RCRA test for ignitability.

There are four separate lists of hazardous wastes in 40 CFR Part 261. If any waste from a PWB facility is on any of these lists, the facility is subject to regulation under RCRA. The listing is often defined by industrial processes, but all wastes are listed because they contain particular chemical constituents (these constituents are listed in Appendix VII to Part 261). Section 261.31 lists wastes from non-specific sources and includes wastes generated by industrial processes that may occur in several different industries; the codes for such wastes always begin with the letter “F.” The second category of listed wastes (40 CFR Section 261.32) includes hazardous wastes from specific sources; these wastes have codes that begin with the letter “K.” The remaining lists (40 CFR Section 261.33) cover commercial chemical products that have been or are intended to be discarded; these have two letter designations, “P” and “U.” Waste codes beginning with “P” are considered acutely hazardous, while those beginning with “U” are simply considered hazardous. Listed wastes from chemicals that are used in an MHC process are shown in Table 4.34. While this table is intended to be as comprehensive as possible, individual facilities may use other chemicals and generate other listed hazardous wastes that are not included in Table 4.34. Facilities may wish to consult the lists at 40 CFR 261.31-261.33.<sup>3</sup>

**Table 4.34 RCRA Hazardous Waste Codes That May Apply to Chemical Wastes From MHC Technologies**

Chemical	U Waste Code	P Waste Code
2-Ethoxyethanol	U359	
1,3-Benzenediol	U201	
Formaldehyde	U122	
Formic Acid	U123	
Methanol	U154	
Potassium Cyanide		P098
Sodium Cyanide		P106

<sup>3</sup> Lists of the “F, P, K and U” hazardous wastes can also be obtained by calling the EPA RCRA/Superfund/EPCRA Hotline at (800) 424-9346.



### **Generator Status**

The hazardous waste generator is defined as any person, by site, who creates a hazardous waste or makes a waste subject to RCRA Subtitle C. Generators are divided into three categories:

- Large Quantity Generators (LQG) - These facilities generate at least 1,000 kg (approximately 2,200 lbs) of hazardous waste per month, or greater than 1 kg (2.2 lbs) of acutely hazardous waste per month.
- Small Quantity Generators (SQG) - These facilities generate greater than 100 kg (approximately 220 lbs) but less than 1,000 kg of hazardous waste per month, and up to 1 kg (2.2 lbs) per month of acutely hazardous waste.
- Conditionally Exempt Small Quantity Generators (CESQG) - These facilities generate no more than 100 kg (approximately 220 lbs) per month of hazardous waste and up to 1 kg (2.2 lbs) per month of acutely hazardous waste.

Large and small quantity generators must meet many similar requirements. 40 CFR Part 262 provides that SQGs may accumulate up to 6,000 kg of hazardous waste on-site at any one time for up to 180 days without being regulated as a treatment, storage, or disposal facility (TSDF) and thereby having to apply for a TSDF permit. The provisions of 40 CFR 262.34(f) allow SQGs to store waste on-site for 270 days without having to apply for TSDF status provided the waste must be transported over 200 miles. LQGs have only a 90-day window to ship wastes off-site without needing a RCRA TSDF permit. Keep in mind that most provisions of 40 CFR Parts 264 and 265 (for hazardous waste treatment, storage and disposal facilities) do not apply to generators who send their wastes off-site within the 90- or 180-day window, whichever is applicable.

Hazardous waste generators that do not meet the conditions for CESQGs must (among other requirements such as record keeping and reporting):

- Obtain a generator identification number.
- Store and ship hazardous waste in suitable containers or tanks (for storage only).
- Manifest the waste properly.
- Maintain copies of the manifest, a shipment log covering all hazardous waste shipments, and test records.
- Comply with applicable land disposal restriction requirements.
- Report releases or threats of releases of hazardous waste.

### **Treatment, Storage, or Disposal Facility Status**

As mentioned above, Subtitle C of RCRA (40 CFR Parts 264 and 265) outlines regulation and permit requirements for facilities that treat, store, or dispose of hazardous wastes. Any generator (except some CESQGs [see 40 CFR Part 261.5(g)]), no matter what monthly waste output, who treats, stores, or disposes of waste on site is classified as a TSDF. Every TSDF must comply with 40 CFR Part 264-267 and Part 270, including requirements to apply for a permit and meet certain stringent technical and financial responsibility requirements. Generators who discharge hazardous waste into a POTW or from a point source regulated by an

NPDES permit are not required to comply with TSDF regulations, nor are generators who store waste for short periods (see Generator Status, above).

### 4.3.5 Comprehensive Environmental Response, Compensation and Liability Act

The Comprehensive Environmental Response, Compensation and Liability Act (also known as CERCLA, or more commonly as Superfund) was enacted in 1980. CERCLA is the Act that created the Superfund hazardous substance cleanup program and set up a variety of mechanisms to address risks to public health, welfare, and the environment caused by hazardous substance releases.

#### CERCLA RQs

Substances deemed hazardous under CERCLA are listed in 40 CFR Section 302.4. Under CERCLA, EPA has assigned a reportable quantity (RQ) to most hazardous substances; regulatory RQs are either 1, 10, 100, 1,000, or 5,000 pounds (except for radionuclides). If EPA has not assigned a regulatory RQ to a hazardous substance, its RQ is one pound (Section 102). Any person in charge of a facility (or a vessel) must immediately (within a 24-hour period) notify the National Response Center as soon as a person has knowledge of a release of an amount of a hazardous substance that is equal to or greater than its RQ.<sup>4</sup> There are some exceptions to this requirement, including exceptions for certain continuous releases and for federally permitted releases. Table 4.35 lists RQs of substances under CERCLA that may apply to chemicals used in the MHC process.

**Table 4.35 CERCLA Reportable Quantities That May Apply to Chemicals in MHC Technologies**

Chemical	CERCLA RQ (lbs)	Chemical	CERCLA RQ (lbs)
1,3-Benzenediol	5,000	Isophorone	5,000
Ammonia	100	Methanol	5,000
Ammonia Chloride	5,000	Phosphoric Acid	5,000
Copper (I) Chloride	10	Potassium Cyanide	10
Copper Sulfate	10	Potassium Hydroxide	1,000
Dimethylformamide	100	Silver	1,000
Ethyl Glycol	5,000	Sodium Cyanide	10
Formaldehyde	100	Sodium Hydroxide	1,000
Formic Acid	5,000	Sulfuric Acid	1,000
Hydrochloric Acid	5,000		

Abbreviations and definitions:

CERCLA - Comprehensive Environmental Response, Compensation and Liability Act

CERCLA RQ - CERCLA reportable quantity

<sup>4</sup> The national toll-free number for the National Response Center is (800) 424-8802; in Washington, DC., call (202) 426-2675.

### CERCLA Liability

CERCLA further makes a broad class of parties liable for the costs of removal or remediation of the release or threatened release of any hazardous substance at a facility. Section 107 specifies the parties liable for response costs, including the following: 1) current owners and operators of the facility; 2) owners and operators of facility at the time hazardous substances were disposed; 3) persons who arranged for disposal or treatment, or for transportation for disposal or treatment of such substances; and 4) persons who accepted such substances for transportation for disposal or treatment. These parties are liable for: 1) all costs of removal or remedial action incurred by the federal government, a state, or an Indian tribe not inconsistent with the National Contingency Plan (NCP); 2) any other necessary costs of response incurred by any person consistent with the NCP; 3) damages for injury to natural resources; and 4) costs of health assessments.

#### **4.3.6 Superfund Amendments and Reauthorization Act and Emergency Planning and Community Right-To-Know Act**

CERCLA was amended in 1986 by the Superfund Amendments and Reauthorization Act (SARA). Title III of SARA is also known as the Emergency Planning and Community Right-To-Know Act (EPCRA). Certain sections of SARA and EPCRA may be applicable to MHC chemicals and PWB manufacturers. Table 4.36 lists applicable provisions as related to specific chemicals.

**Table 4.36 SARA and EPCRA Regulations That May Apply to Chemicals in MHC Technologies**

Chemical	SARA 110	EPCRA 302a	EPCRA 313	Chemical	SARA 110	EPCRA 302a	EPCRA 313
2-Ethoxyethanol			✓	Hydrochloric Acid		✓	✓
Ammonia	✓	✓	✓	Hydrogen Peroxide		✓	
Copper (I) Chloride	✓		✓	Isopropyl Alcohol	✓		✓
Copper Sulfate	✓		✓	Methanol			✓
Dimethylformamide			✓	Phosphoric Acid			✓
Ethylene Glycol			✓	Potassium Cyanide		✓	✓
EDTA			✓	Silver	✓		✓
Fluoroboric Acid (as fluoride)	✓			Sodium Cyanide		✓	✓
Formaldehyde	✓	✓	✓	Stannous Chloride (as tin)	✓		
Formic Acid			✓	Sulfuric Acid		✓	✓

Abbreviations and definitions:

SARA - Superfund Amendments and Reauthorization Act

SARA 110 - Superfund Site Priority Contaminant

EPCRA - Emergency Planning & Community Right-To-Know Act

EPCRA 302a - Extremely Hazardous Substances

EPCRA 313 - Toxic Chemical Release Inventory

### **SARA Priority Contaminants**

SARA Section 110 addresses Superfund site priority contaminants. This list contains the 275 highest ranking substances of the approximately 700 prioritized substances. These chemical substances, found at Superfund sites, are prioritized based on their frequency of occurrence, toxicity rating, and potential human exposure. Once a substance has been listed, the Agency for Toxic Substances and Disease Registry (ATSDR) is mandated to develop a toxicological profile that contains general health/hazard assessments with effect levels, potential exposures, uses, regulatory actions, and further research needs.

### **EPCRA Extremely Hazardous Substances**

Section 302(a) of EPCRA regulates extremely hazardous substances and is intended to facilitate emergency planning for response to sudden toxic chemical releases. These chemicals, if present in quantities greater than their threshold planning quantities, must be reported to the State Emergency Response Commission and Local Emergency Planning Committee and addressed in community emergency response plans. These same substances are also subject to regulation under EPCRA Section 304, which requires accidental releases in excess of reportable quantities to be reported to the same state and local authorities.

### **EPCRA Toxic Release Inventory**

Under EPCRA Section 313, a facility in SIC Codes 20-39 that has ten or more full-time employees and that manufactures, processes, or otherwise uses more than 10,000 or 25,000 pounds per year of any toxic chemical listed in 40 CFR Section 372.65 must file a toxic chemical release inventory (TRI) reporting form (EPA Form R) covering releases of these toxic chemicals (including those releases specifically allowed by EPA or state permits) with the EPA and a state agency where the facility is located. Beginning with the 1991 reporting year, such facilities must also report pollution prevention and recycling data for TRI chemicals pursuant to Section 6607 of the Pollution Prevention Act, 42 USC 13106. The threshold for reporting releases is 10,000 or 25,000 pounds, depending on how the chemical is used (40 CFR Section 372.25). Form R is filed annually, covers all toxic releases for the calendar year, and must be filed on or before the first of July of the following year.

#### **4.3.7 Toxic Substances Control Act**

The Toxic Substances Control Act (TSCA)(40 CFR Part 700-799), originally passed in 1976 and subsequently amended, applies to the manufacturers, importers, processors, distributors, users, and disposers of chemical substances or mixtures. Table 4.37 lists TSCA regulations that may be pertinent to the MHC process.

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**Table 4.37 TSCA Regulations That May Apply to Chemicals in MHC Technologies**

Chemical	TSCA 8d HSDR	TSCA 8a MTL	TSCA 8a PAIR	Chemical	TSCA 8d HSDR	TSCA 8a MTL	TSCA 8a PAIR
Benzotriazole	✓			Palladium Chloride			✓
Diethylene Glycol Methyl Ether	✓		✓	Silver			✓
Dimethylformamide	✓		✓	Sodium Cyanide		✓	
Formaldehyde		✓		Triethanolamine		✓	✓
Isophorone	✓		✓	Vanillin		✓	
Isopropyl Alcohol		✓	✓				

Abbreviations and definitions:

TSCA - Toxic Substances Control Act

TSCA 8d HSDR - Health & Safety Data Reporting Rules

TSCA MTL - Master Testing List

TSCA 8a PAIR - Preliminary Assessment Information Rule

### **Testing Requirements**

Section 4 authorizes EPA to require the testing of any chemical substance or mixture on finding that such testing is necessary due to insufficient data from which the chemical's effects can be predicted and that the chemical either may present an unreasonable risk of injury to health or the environment or the chemical is produced in substantial quantities or may result in substantial human exposure.

The TSCA Master Testing List (MTL) is a list compiled by EPA's Existing Chemicals Program to set the Agency's testing agenda under TSCA Section 4. The major purposes are to: 1) identify chemical testing needs; 2) focus limited EPA resources on those chemicals with the highest priority testing needs; 3) identify and publicize EPA's testing priorities for existing chemicals; 4) obtain broad public comments on EPA's testing program and priorities; and 5) encourage initiatives by industry to help EPA meet those priority needs. Since 1990, EPA has: 1) added 222 specific chemicals and nine categories to the MTL; 2) deleted 45 chemicals from the MTL; 3) proposed testing for 113 chemicals via proposed rulemaking under TSCA Section 4; 4) required testing for six chemicals and one category via final TSCA Section 4 test rules, negotiated consent orders, or voluntary testing agreements; and 5) made risk assessment or management decisions on 41 chemicals based on TSCA Section 4 test results received. The MTL now contains over 320 specific chemicals and nine categories.

### **Existing Chemical Requirements**

Section 6 authorizes EPA, to the extent necessary to protect adequately against unreasonable risk using the least burdensome requirements, to prohibit the manufacture, processing, or distribution in commerce of a chemical substance; to limit the amounts, concentrations, or uses of it; to require labeling or record keeping concerning it; or to prohibit or otherwise regulate any manner or method of disposal, on finding there is a reasonable basis to conclude that the chemical presents or will present an unreasonable risk of injury to human health or the environment.

### **Preliminary Assessment Information Rules**

Section 8(a) of TSCA, the Preliminary Assessment Information Rules (PAIR), establishes procedures for chemical manufacturers and processors to report production, use, and exposure-related information on listed chemical substances. Any person (except a “small business”) who imports, manufactures, or processes chemicals identified by EPA by rule must report information on production volume, environmental releases, and/or chemical releases. Small businesses are required to report such information in some circumstances.

#### **4.3.8 Occupational Safety and Health Act**

##### **OSHA Hazard Communication Standard**

The Occupational Safety and Health Administration (OSHA) governs the exposure of workers to chemicals in the workplace. Any facility that is required by OSHA’s Hazard Communication Standard (29 CFR Section 1910.1200) to have Material Safety Data Sheets (MSDSs) for certain hazardous chemicals, and that has such chemicals above certain minimum threshold levels, must provide copies of the MSDSs for these substances or a list of the substances to the State Emergency Response Commission (SERC), the Local Emergency Planning Commission (LEPC), and the local fire department. MSDSs must also be made available to workers. In addition, facilities must annually submit to the SERC, the LEPC, and the fire department a Tier I report indicating the aggregate amount of chemicals (above threshold quantities) at their facilities, classified by hazard category. If any agency that receives a Tier I report requests a Tier II report requiring additional information, facilities must submit this second report to the agency within 30 days of receiving a request for such a report. Tier II reports include an inventory of all chemicals at the facility. Most of the chemicals used in the MHC technologies industry are subject to these MSDS and Tier reporting requirements (40 CFR Part 370).

#### **4.3.9 Summary of Regulations by MHC Technology**

Tables 4.38 through 4.45 provide a summary of regulations that may apply to chemicals in each of the MHC technology categories. Chemicals listed in bold in the tables are used in all of the technology product lines evaluated. For example, formaldehyde is used in all of the electroless copper lines evaluated in this study, but dimethylformamide is only used in one product line. PWB manufacturers should check with their chemical supplier or review their MSDSs to determine which chemicals are present in the products they use.

Chemicals and wastes from the MHC alternatives appear to be subject to fewer overall federal environmental regulations than electroless copper. This suggests that implementing an alternative could potentially improve competitiveness by reducing compliance costs.

## 4.3 REGULATORY STATUS

**Table 4.38 Summary of Regulations That May Apply to Chemicals in the Electroless Copper Technology**

Process Chemical <sup>a</sup>	Chemicals Subject to Applicable Regulation																
	CWA				SDWA		CAA			SARA 110	EPCRA		TSCA			RCRA	Waste
	304b	307a	311	Priority Pollutant	NPDWR	NSDWR	111	112b	112r		302a	313	8d HSDR	MTL	8a PAIR	P	U
Ammonium Chloride			✓														
Benzotriazole						✓						✓					
Boric Acid																	
Copper (I) Chloride <sup>b</sup>	✓	✓	✓	✓	✓	✓				✓		✓					
Copper Sulfate <sup>b</sup>	✓	✓	✓	✓	✓	✓				✓		✓					
Dimethylaminoborane																	
Dimethylformamide				✓		✓	✓	✓				✓	✓		✓		
Ethanolamine																	
2-Ethoxyethanol							✓	✓				✓				359	
Ethylenediaminetetraacetic Acid (EDTA)			✓														
Ethylene Glycol				✓			✓	✓				✓					
Fluoroboric Acid (as fluoride)	✓				✓	✓	✓			✓							
Formaldehyde			✓				✓	✓	✓	✓	✓	✓		✓		122	
Formic Acid			✓	✓			✓					✓				123	
Hydrochloric Acid <sup>c</sup>			✓					✓	✓		✓	✓					
Hydrogen Peroxide											✓						
Hydroxyacetic Acid																	
Isopropyl Alcohol, 2- Propanol										✓		✓		✓	✓		
m-Nitrobenzene Sulfonic Acid																	
Magnesium Carbonate																	

## 4.3 REGULATORY STATUS

Process Chemical <sup>a</sup>	Chemicals Subject to Applicable Regulation																
	CWA				SDWA		CAA			SARA 110	EPCRA		TSCA			RCRAWaste	
	304b	307a	311	Priority Pollutant	NPDWR	NSDWR	111	112b	112r		302a	313	8d HSDR	MTL	8a PAIR	P	U
Methanol				✓			✓	✓			✓					154	
Palladium																	
Peroxymonosulfuric Acid																	
Potassium Bisulfate																	
Potassium Cyanide		✓	✓	✓	✓			✓			✓	✓			098		
Potassium Hydroxide			✓														
Potassium Persulfate																	
Potassium Sodium Tartrate																	
Potassium Sulfate																	
Sodium Bisulfate			✓														
Sodium Carbonate																	
Sodium Chlorite																	
Sodium Cyanide		✓	✓	✓				✓			✓	✓		✓	106		
Sodium Hydroxide			✓														
Sodium Hypophosphite																	
Sodium Sulfate																	
Stannous Chloride	✓									✓							
Sulfuric Acid			✓				✓				✓	✓					
Tartaric Acid																	
p-Toluene Sulfonic Acid																	
Triethanolamine													✓	✓			

<sup>a</sup> Chemicals in bold were in all electroless copper technologies evaluated, unless otherwise noted.

<sup>b</sup> Either copper (I) chloride or copper sulfate was in all electroless copper lines evaluated.

<sup>c</sup> Hydrochloric acid was listed on the MSDSs for five of six electroless copper lines.



## 4.3 REGULATORY STATUS

**Table 4.39 Summary of Regulations That May Apply to Chemicals in the Carbon Technology**

Process Chemical <sup>a</sup>	Chemicals Subject to Applicable Regulation																
	CWA				SDWA		CAA			SARA 110	EPCRA		TSCA			RCRA Waste	
	304b	307a	311	Priority Pollutant	NPDWR	NSDWR	111	112b	112r		302a	313	8d HSDR	MTL	8a PAIR	P	U
Carbon Black																	
Copper Sulfate	✓	✓	✓	✓	✓	✓				✓		✓					
Ethanolamine																	
Ethylene Glycol				✓			✓	✓				✓					
Potassium Carbonate																	
Potassium Hydroxide			✓														
Sodium Persulfate																	
Sulfuric Acid			✓				✓			✓		✓					

<sup>a</sup> Only one carbon technology was evaluated. All chemicals listed were present in that product line.

## 4.3 REGULATORY STATUS

**Table 4.40 Summary of Regulations That May Apply to Chemicals in the Conductive Ink Technology**

Process Chemical <sup>a</sup>	Chemicals Subject to Applicable Regulation																
	CWA				SDWA		CAA			SARA	EPCRA		TSCA			RCRA Waste	
	304b	307a	311	Priority Pollutant	NPDWR	NSDWR	111	112b	112r	110	302a	313	8d HSDR	MTL	8a PAIR	P	U
2-Butoxyethanol Acetate							✓										
Carbon Black																	
Diethylene Glycol n-Butyl Ether																	
Diethylene Glycol Ethyl Ether							✓										
Diethylene Glycol Methyl Ether							✓	✓					✓		✓		
Graphite																	
Isophorone	✓	✓		✓			✓	✓					✓		✓		
Methanol							✓	✓				✓					154
Silver	✓	✓		✓		✓				✓		✓			✓		

<sup>a</sup> Only one conductive ink technology was evaluated. All chemicals listed were present in that product line.

## 4.3 REGULATORY STATUS

**Table 4.41 Summary of Regulations That May Apply to Chemicals in the Conductive Polymer Technology**

Process Chemical <sup>a</sup>	Chemicals Subject to Applicable Regulation																
	CWA				SDWA		CAA			SARA 110	EPCRA		TSCA			RCRA Waste	
	304b	307a	311	Priority Pollutant	NPDWR	NSDWR	111	112b	112r		302a	313	8d HSDR	MTL	8a PAIR	P	U
1H-Pyrrole																	
Peroxymonosulfuric Acid																	
Phosphoric Acid			✓								✓						
Sodium Carbonate																	
Sodium Hydroxide			✓														
Sulfuric Acid			✓				✓				✓	✓					

<sup>a</sup> Only one conductive polymer technology was evaluated. All chemicals listed were present in that product line.

Table 4.42 Summary of Regulations That May Apply to Chemicals in the Graphite Technology

Process Chemical <sup>a</sup>	Chemicals Subject to Applicable Regulation																
	CWA				SDWA		CAA			SARA	EPCRA		TSCA			RCRA Waste	
	304b	307a	311	Priority Pollutant	NPDWR	NSDWR	111	112b	112r	110	302a	313	8d HSDR	MTL	8a PAIR	P	U
Ammonia	✓		✓						✓	✓	✓	✓					
Copper Sulfate	✓	✓	✓	✓	✓	✓				✓		✓					
Ethanolamine																	
Graphite																	
Peroxymonosulfuric Acid																	
Potassium Carbonate																	
Sodium Persulfate																	
Sulfuric Acid			✓				✓				✓	✓					

<sup>a</sup> Chemicals in bold were in both graphite technologies evaluated.

## 4.3 REGULATORY STATUS

**Table 4.43 Summary of Regulations That May Apply to Chemicals in the Non-Formaldehyde Electroless Copper Technology**

Process Chemical <sup>a</sup>	Chemicals Subject to Applicable Regulation															
	CWA				SDWA		CAA			SARA 110	EPCRA		TSCA			RCRA Waste
	304b	307a	311	Priority Pollutant	NPDWR	NSDWR	111	112b	112r		302a	313	8d HSDR	MTL	8a PAIR	P U
Copper Sulfate	✓	✓	✓	✓	✓	✓				✓		✓				
Hydrochloric Acid			✓					✓	✓		✓	✓				
Hydrogen Peroxide											✓					
Isopropyl Alcohol (2-propanol)										✓		✓		✓	✓	
Potassium Hydroxide			✓													
Potassium Persulfate																
Sodium Chlorite																
Sodium Hydroxide			✓													
Stannous Chloride										✓						
Sulfuric Acid			✓				✓				✓	✓				

<sup>a</sup> Only one non-formaldehyde electroless copper technology was evaluated. All chemicals listed were present in that product line.

Table 4.44 Summary of Regulations That May Apply to Chemicals in the Organic-Palladium Technology

Process Chemical <sup>a</sup>	Chemicals Subject to Applicable Regulation																
	CWA				SDWA		CAA			SARA 110	EPCRA		TSCA			RCRA Waste	
	304b	307a	311	Priority Pollutant	NPDWR	NSDWR	111	112b	112r		302a	313	8d HSDR	MTL	8a PAIR	P	U
Hydrochloric Acid			✓					✓	✓		✓	✓					
Sodium Bisulfate			✓														
Sodium Carbonate																	
Sodium Bicarbonate																	
Sodium Hypophosphite																	
Sodium Persulfate																	
Trisodium Citrate 5,5-Hydrate or Sodium Citrate																	

<sup>a</sup> Only one organic-palladium technology was evaluated. All chemicals listed were present in that product line.

### 4.3 REGULATORY STATUS

**Table 4.45 Summary of Regulations That May Apply to Chemicals in the Tin-Palladium Technology**

Process Chemical <sup>a</sup>	Chemicals Subject to Applicable Regulation															
	CWA				SDWA		CAA			SARA	EPCRA		TSCA			RCRA Waste
	304b	307a	311	Priority Pollutant	NPDWR	NSDWR	111	112b	112r	110	302a	313	8d HSDR	MTL	8a PAIR	P U
1,3-Benzenediol							✓									201
<b>Copper (I) Chloride<sup>b</sup></b>	✓	✓	✓	✓	✓	✓				✓		✓				
<b>Copper Sulfate<sup>b</sup></b>	✓	✓	✓	✓	✓	✓				✓		✓				
Dimethylaminoborane																
Ethanolamine																
Fluoroboric Acid (as fluoride)					✓	✓	✓			✓						
<b>Hydrochloric Acid<sup>c</sup></b>			✓					✓	✓		✓	✓				
Hydrogen Peroxide											✓					
Isopropyl Alcohol (2-propanol)										✓		✓		✓	✓	
Lithium Hydroxide																
<b>Palladium<sup>d</sup></b>																
<b>Palladium Chloride<sup>d</sup></b>															✓	
Phosphoric Acid			✓									✓				
Potassium Carbonate																
Sodium Bisulfate			✓													
Sodium Chloride																
Sodium Hydroxide			✓													
Sodium Persulfate																
<b>Stannous Chloride<sup>e</sup></b>										✓						
<b>Sulfuric Acid<sup>c</sup></b>			✓				✓				✓	✓				
Triethanolamine														✓	✓	
Vanillin														✓		

<sup>a</sup> Chemicals in bold were in all tin-palladium technologies evaluated, unless otherwise noted.

<sup>b</sup> Either copper (I) chloride or copper sulfate was listed on the MSDSs for four of five tin-palladium lines evaluated.

<sup>c</sup> Hydrochloric and sulfuric acid were listed on the MSDSs for four of five tin-palladium lines evaluated.

<sup>d</sup> Palladium or palladium chloride was listed on the MSDS for three of five tin-palladium lines evaluated. The MSDSs for the two other lines did not list a source of palladium.

<sup>e</sup> Stannous chloride was listed on the MSDSs for four of the five tin-palladium lines evaluated. The MSDSs for the remaining tin-palladium product line did not list a source of tin or palladium.